XIII. *On the* Lucanidæ *of Japan.* By George Lewis.

[Read July 4th, 1883.]

Plate XIV.

There are fifteen species of *Lucanini* and one species of *Passalini* known now from Japan, and the list of these, with their synonymy, stands, I believe, as follows :—

Lucanini.

Lucanus maculifemoratus, Motsch.
= *sericans*, Voll.
= *Hopei*, Parry.
Cladognathus inclinatus, Motsch.
= *mandibularis*, Thoms.
= *inflexus*, Harold.
Prismognathus angularis, C. Waterh.
Eurytrachelus platymelus, Saund.
= *castanicolor* (*Serrognathus*), Motsch.
Macrodorcus rubrofemoratus, Motsch.
,, *montivagus*, n. s.
,, *rectus*, Motsch.
= *Niponensis*, Voll.
= *diabolicus*, Thoms.
= *rugipennis*, Motsch.
Macrodorcus striatipennis, Motsch.
= *binervis*, Motsch.
= *cribellatus*, Motsch.
= *opacus*, C. Waterh.
= *Vanvolxemi*, Lewis.
Dorcus Hopei, Saund.
= *binodulosus*, C. Waterh.
Ægus subnitidus, C. Waterh.
Platycerus delicatulus, n. s.
Figulus binodulosus, C. Waterh.
,, *punctatus*, C. Waterh.
Ceruchus lignarius, n. s.
Æsalus Asiaticus, n. s.

Passalini.

Aulacocyclus patalis, n. s.

There is no *Sinodendron* known yet from Japan.

In this list I have omitted *Lucanus Cantori*, Hope, and *Prismognathus dauricus*, Motsch., because the evidence of their being natives of Japan seems to me insufficient. *Lucanus Cantori* is a native of Assam, and although Motschulsky says, in the 'Etudes' of 1860, that Madame Goschkevitch obtained it in Japan, in the 'Etudes' of 1861, in treating of the same material, he gives us, without any reference to *Cantori*, *maculifemoratus*. His first determination thus appears incorrect, and the specimens available to-day from Japan confirm this. By the kindness of Major F. J. S. Parry I have been able to examine specimens of *Prismognathus dauricus* from the mainland of Asia. Motschulsky described this in 1860, but his remarks in

the 'Etudes' of the next year apply, as I conceive, to *angularis*; yet there can be no doubt that the insects are specifically distinct.

Major Parry has also kindly pointed out to me that *Serrognathus castanicolor*, Motsch., is an immature male example of *Eurytrachelus platymelus*, Saunders. In 1874 Dr. Renard sent Major Parry a drawing of Motschulsky's type, made by Professor Lindemann, and the drawing, which I have seen, at once disclosed the fact that these two names apply to the same insect.

It will be seen from the synonymy of the list and the remarks above that some little confusion has arisen in the determination of the species of the group generally, and this has been owing chiefly to the want of sufficient material by early authors, for had they had a long series they would have been able to discriminate between the forms which compose a species and the species themselves.

To enable the student of *Lucanidæ* rightly to estimate the value of the different forms which usually exist in, and partly constitute the peculiarities of, a species, it is of all things necessary that he should possess and carefully examine a long series of specimens of each kind, for each species is subject to great and apparently divergent modifications of the members composing it, especially in the males. Often the largest form, and a form midway between it and the smallest form, are the most abundant in individuals, and most constant in size and structure; while the intermediate and connecting forms are scarce, or even of great rarity. But I have said apparently divergent because there are not, as it might first appear, various forms, for all are developments of one type depending on the amount of growth of some or all parts of the individual. There is no tendency towards any (comparatively speaking) permanent divergent line beyond what we can trace to the result of size and individual vigour of constitution; for, in the Japan insects at least, it is merely a matter of finding the intermediate links before a complete series can be arranged bridging over all the individual differences.

Now these remarks must be applied chiefly to the larger species of the family contained in the genera *Lucanus*, *Cladognathus*, *Dorcus*, and *Macrodorcus*, for when we arrive at the genus *Platycerus* we find but little in

the way of variation which extends beyond what we observe in many other insects. There are the sexual differences of the family and little more, and *Figulus* also follows in the same line, but has no external sexual characters to speak of. We see, then, that the vigorous forms of the family (*Lucanus*) have acquired a sexual development which is not shared in by the smaller forms (*Figulus*).

The *Lucanidæ* of Japan are all reared in decaying trees, and the variation which occurs in the individuals of their species relates chiefly to size, and can, I think, only be traced to the feeding of their larvæ. The larval condition of insects is the stage of growth; the period from the egg to the pupa is the time when an insect increases in size and weight, and it is certain that many of the eggs deposited in summer will be laid on such parts of decaying trees which are too hard, or perhaps too rotten, for the larvæ to thrive on. And even more than this, they may be laid on trees of harder texture or closer fibre than is essential for the highest development of the larvæ; and many larvæ of *Lucanidæ*, as in other insects, die simply of starvation at the first or at another early stage. Small varieties of a *Lucanus* are to me simply those forms which escape starvation, and yet are emaciated by poverty of food, and each individual increases in stature, in proportion to the nutriment of its food, until it reaches the form *maximus*. A familiar case to us all of the result of nutritious diet is the queen bee, and last year Mr. Pryer gave us another instance in drawing attention to Japan Papilios.

Sometimes in a northern country we find insects which have affinities in the tropics, and we see that the northern forms are much larger than their southern congeners. As an example, take *Rhysodes*. The Japan species is half as large again as the Ceylon species, because the first lives in beeches, elms, and oaks, while the second feeds in the hard-wooded tropical trees, which are, as I believe, less nourishing. (Trans. Ent Soc. Lond., 1882, pp. 476 and 482).

But we need not depart from the *Lucanidæ* for an example of this, as the *Lucanidæ* themselves are rare in the Ceylonese jungle, and many hundreds of specimens can be collected in a summer day in Yezo, where deciduous trees are the rule and not the exception. As regards the *Platycerus*, it being of a small size, the

larvæ can get sufficient nutriment where a larger species would starve, and this is perhaps enough to account for its constant size and moderate sexual differences. Even in *Macrodorcus*, the *rubrofemoratus* is more constant in size than some of the others, and on the 8th June, 1880, I took, at Chiuzenji, fifty specimens from a single beech, and into this tree my axe was easily driven four or five inches by a fair blow. The larvæ here could penetrate the whole tree, and obtain such nutriment as was necessary for normal development, and under these conditions there was no conspicuous variation in the size of the imagos. The *Prismognathus* again, which varies but little, feeds in rotten birch trees, a tree which, like the beech, rots quickly away, and is different in this respect both to the oaks and to the tropical hard-wooded trees, which only decay by inches at a time.

The larva of a *Cicindela*, *Carabus*, or *Dytiscus* has the power and habit of seeking food, and can generally obtain what is necessary; but wood-feeding larvæ, such as those of *Lucanidæ* and *Cerambycidæ*, the imagos of which vary so much in size, are almost wholly dependent on the incident of the whereabouts a certain female may deposit her ova: if on or near very hard wood they are starved; if on more nutritious material they become vigorous. Roughly speaking, in a *Cicindela* the size is constant and normal, and in a *Cerambyx* variable and irregular. A tree-larva, while feeding and coming on a hard knob or nodule, may become starved or emaciated, but a ground-feeding species is not isolated in the same way, and the evidence of its better position is that it varies less in bulk and stature.

It thus appears probable that when a species, during a long series of generations, has lived (without the exertion of finding it) amidst an abundant, but occasionally variable, supply of easily assimilated food, it has acquired a superior stature for its individuals, the acquisition of which carries with it a capacity of special sexual development. And at the same time the species obtains to a greater plasticity than in other kinds, which enables it under less favourable circumstances to continue to preserve its species through the instrumentality of individuals of lesser development. But the idea that these small specimens indicate a retrograde movement towards a primitive form is, I think, contrary to the general principles of Nature's workings; because,

although we may say it is by heredity that the *Lucanidæ* retain their ordinary peculiarities, the strange excrescences and huge mandibles in some males is a result arising from the necessity of placing the tissue gathered by a vigorous larva in becoming full-fed. It is of individual, not specific, value. It is a process within a single organism, as in the queen bee, resulting in an abnormal development.

In the following notes of species I have given the number of specimens in my collection, as I think it an important statistic; but in the forests of Japan I have examined many hundreds of specimens of the commoner kinds in the living state, and had it been otherwise I should hardly have been able to unite such insects as *Macrodorcus opacus* with *striatipennis*, nor could I have sunk with confidence other names relating only to forms of parallel value.

Prismognathus angularis, C. Waterh. (Pl. XIV., fig. 1).

The type of this species, female, I obtained in Kawachi in 1871. Lately I obtained ten males and two females, all from old birch trees or logs.

The localities are Chiuzenji, Junsai, and Sapporo, and the specimens only show slight variation in size and form.

Macrodorcus rubrofemoratus, Motsch.

This is a very distinct species; in the south of Japan it occurs only at very high elevations, but in Yezo it is common at sea-level. It was most abundant in the beech forests above the Lake of Hakone, and at Chiuzenji; and it was found also in Kiushiu on Oyayama.

Twenty males, eleven females.

Macrodorcus montivagus, n. s. (Pl. XIV., fig. 2).

♂. Niger, opacus, undique minute punctulatus, mandibulis capitis longitudine, robustus arcuatis, ante medium dente acuto armatis. Prothorace transverso, lateribus post medium dente acuto instructis. Long. cum mandib. 18—19 lin.

♀. Capite fortiter rugoso, medio bituberculato;

medio nitido, parce punctulato lateribus rugulosis. Long. cum mandib. 18 lin.

Six males, eight females.

I have figured the male of this, and I should not have ventured to describe it as other than a variety of *striatipennis* or *rectus* were it not so evidently a small development of a species. The punctuation of the mentum agrees fairly with *rectus*, but it is more vermiform and confluent. The female is so large that a fully-developed male must be very much larger than the form I know. It is a scarce species, and I obtained only a few specimens, and these all occurred at sap where the large *Hepiali* were feeding. Chiuzenji, Junsai, and Nanaye are the localities.

Macrodorcus striatipennis, Motsch.

I found this species in immense profusion in Yezo, and in all the elevated forests of the main island. It is not common in Kiushiu, but I have specimens from Oyayama and Tanegashima.

Dorcus Hopei, Saunders.

This species is apparently rare; large males measure over 31 lines. I obtained it at Kobè, Kioto, and Sendai. Seven males, three females.

D. binodulosus, C. Waterh., is an undeveloped male of 17½ lines.

Ægus subnitidus, C. Waterh.

This has its affinities in tropical species; it is common in Kiushiu in fir "stools," but it only occurs as far north as Kioto, and is rare there. It has its large and small forms. Thirteen males, five females.

Platycerus delicatulus, n. s. (Pl. XIV., fig. 3).

♂. Nigro-cæruleus, subnitidus, capite thoraceque sat fortiter punctatis, mandibulis capitis longitudine. Antennis nigris. Elytris tenuiter striatis et rugoso-punctatissimis, pedibus testaceis, his geniculis nigris. Long. 6½ lin.

♀. Æneus, seu nigro-cæruleus, tibiis plerumque solum testaceis. Long. 5½ lin.

Twenty-five males, twenty females.

Above blue-black, rather shining, rather parallel; beneath black. Head rather thickly and strongly punctured; clypeus smooth, excrescences in front of eyes prominent; mandibles black; when closed the basal teeth close on to the clypeus, and nearly touch each other. The upper part of each tooth forms a ridge, which extends along the mandible, forming a medial carina. The punctuation of the thorax is rather finer than that of the head, and in shape and dilatation at sides agrees with *P. quercus*, Weber; scutellum is smooth at the base; elytra sculptured in the usual form of the genus. The legs are testaceous; knee-joints and front tibiæ black; tarsi pitchy.

The female is more variable in colour, being brassy, brassy green, and blue-black, with the middle and hind tibiæ only generally pale; but I have specimens with wholly red legs, and one with legs entirely black.

P. delicatulus is of more slender form than *caraboides*, and the elytra are somewhat more depressed in the front of the middle, with the apical callosities more prominent. The sculpture, too, is considerably finer; in the male the apical teeth of the front tibiæ are but little developed, and the crenulations above them are remarkably regular, there being an absence of any tooth standing out from the rest in a prominent manner. The middle tibiæ also are without any external teeth.

Found in June at Oyayama, Odaigahara, Chiuzenji; and on Ontake in August.

Figulus, like *Ægus*, is a tropical genus. I took twenty specimens of *F. binodulosus*, C. Waterh., at Konose in May, 1881, from an old log in the forest; all the specimens are alike and agree well with Waterhouse's type and description. Of *F. punctatus* I obtained only one specimen from an old Celtis at Nagasaki in February, and I believe it is a good species. There are five specimens in my original collection.

Ceruchus lignarius, n. s. (Pl. XIV., fig. 4).

Niger, nitidus, capite utrinque rugoso, in medio sparse punctato, fronte in medio excavato, prothorace punctato apice læve marginato; elytris striatis, interstitiis sparse punctatis. Long. cum mandib. $7\frac{1}{2}$ lin.

♀, mihi ignota.

Three males.

Pitchy black, shining; mandibles punctured like the head;* head excavated in front behind the clypeus, very rugose at the sides, smooth in middle, with rather large scattered punctures on the disc. Thorax transverse, more finely punctured than the head, with two shallow foveæ on each side. The margin in front is smooth, at the sides narrowly raised, reflexed at the posterior angle, and continued round the base. The interstices of the elytral striæ are punctured like the thorax.

I obtained two examples at Sapporo early in August, 1880, and one (dead) under a stone on Niohosan the following year. From the numerous fragments I saw of it amongst stored timber at Sapporo I concluded that it must be common there in early summer.

Æsalus Asiaticus, n. s. (Pl. XIV., fig. 5).

Ovalis, niger opacus rugose sculpturatus, squamis brunneis plus minusve dense variegatus, maculisque tomentosis erectis nigris. Long. $2\frac{1}{2}$—$2\frac{3}{4}$ lin.

Seven males, thirteen females.

Oval, rather convex, opaque, very roughly sculptured, and more or less clothed with brown scales. Beneath the scales there is a surface with distinct, rather shallow and somewhat irregular, punctures. Forehead depressed. Thorax has a medial line free of scales or setæ, and on each side are two clumps of thick black setæ, and above the last an ill-defined crescent of the same. The elytra have, including a sutural line, fine lines of black spinose maculations, which give a clear tesselated appearance. The sexual characters are the same as in *Æ. scarabæoides* of Europe.

This species is interesting as being a second species in a remarkable genus. The individuals are considerably smaller than those of *scarabæoides*, and the black tomentum, forming well-marked separate spots or patches on the elytra, give *asiaticus* quite a different appearance. Not knowing the genus *Æsalus* when I first took the species, I thought it was one of the *Colydiidæ*.

This little species occurs in large forests of considerable elevation. I obtained it first in May, 1880, above Miyanoshita. I took off bark from a fallen tree which was

* Each mandible is as long as the head, reflexed, with two teeth, one basal the other ante-medial, and in this respect is nearer the American *striatus* than the European *tenebrioides*.

dead and moss-grown, and then found it in little round holes it had gnawed out in the wood under the bark to winter in. In June I found it at Chiuzenji, and the following spring on Oyayama, near Kumamoto, always getting it in the way described.

Aulacocyclus patalis, n. s. (Pl. XIV., figs. 6, 7).

Convexus, parum elongatus, niger nitidus, capite dilatato, utrinque lamina erecta, apicem versus latiore, margine superiore emarginato. Prothorace convexiusculo minutissime punctato, anteriore in medio binoduloso, dorso canaliculato; elytris striis punctatis, interstitiis convexis. Long. $8\frac{1}{2}$—9 lin.

Twenty-five specimens.

Convex, black, shining; head impunctate and dilated; the outer margins at each side are produced into robust spreading horns, and the anterior angles of the head are acute and prominent, with a carina running back from them and half crossing the eye. The thorax is smooth, with very fine scattered punctures, emarginate at the sides and base. Anteriorly the middle is produced into two rather prominent nodules; the elytra are very convex for this genus, and deeply punctate-striate with convex interstices. There is no external difference in the sexes. In the genus *Nigidius* the frontal carina completely crosses the eye, dividing it in the middle.

This species is very distinct from any other yet known, and perhaps later a new genus should be formed for its reception. But it would not be easy to define it at present owing to the want of some of its nearest allies for comparison, and the fact that Kaup's genera of *Passalini* are somewhat vaguely characterised. *A. platypus*, Kaup, from Thibet, of which there is a series in the National Collection, is the nearest species I know to it.

I took twenty specimens on the 11th May, 1881, in three or four decaying hard-wood trees of three feet girth, which had been blown down and had remained five or six years under shade of a dense forest above Yuyama, on the western side of Ichibosayama. The bark came off easily in the hand, and the specimens were resting, after the manner of *Passalini*, in the black wood-mould it had covered. A native collector the next year obtained a few more on the same spot. I found *Passalini* in Ceylon in corresponding abundance to the *Lucanini* in Yezo.

Explanation of Plate XIV.

Fig. 1. *Prismognathus angularis*, C. Waterh. ♂.
2. *Macrodorcus montivagus*. ♂.
3. *Platycerus delicatulus*. ♂.
4. *Ceruchus lignarius*. ♂.
5. *Æsalus Asiaticus*. ♂.
6. *Aulacocyclus patalis*.
7. Ditto, side view of head.